IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor: **J. Surjan**			Examiner: **R. Sellers**
Application No.:	**10/500,128**	Conf. No. **7387**	Art Unit: **1796**
Filed:	**June 25, 2004**		Atty. Docket: **P25624-A USA**

For: **ADHESIVE OF EPOXY COMPOUND, ALIPHATIC AMINE, AND TERNARY AMINE**

FILED ELECTRONICALLY

AFFIDAVIT OF DR. WAYNE LIU
SUBMITTED UNDER 37 C.F.R. 1.132

I, Wayne Liu, declare and state that:

1. I am involved in the prosecution of the above-mentioned patent application. I have a PhD in Material Science & Engineering from the Illinois Institute of Technology. I have been employed by Illinois Tool Works Inc. (ITW) since 1999 and current serve as a Research Associate at the ITW Technology Center. I have extensive experience in developing and testing epoxy adhesives, particularly those that are useful as concrete anchors.

2. I am familiar with the prosecution history of the above-mentioned patent application and understand that the claimed invention, in part, is directed to a curable adhesive composition for anchoring materials in or to concrete or masonry comprising a polymerizable epoxy compound and a curing agent consisting essentially of a plurality of aliphatic amines and at least one tertiary amine, wherein said adhesive composition has an epoxy:amine weight ratio of about 0.5:1 to about 10:1. I also understand that the Patent Office has rejected the claimed invention as being obvious over several ITW patents including US 6,291,555 (Surjan '555), US 6,403,678 (Surjan '678), and US 6,420,458 (Surjan '458) among others.

3. I have personally participated in, and/or reviewed, the generation of experimental data provided in Table 1 that is attached to this Declaration. As discussed in more detail below, this data demonstrates that epoxy resins cured with a combination of two or more aliphatic amines and at least one tertiary amine have a pullout strength that is significantly higher than the pullout strength of epoxy resins cured by curing agents known in the art.

4. The purpose of the tests described herein is to perform a "side-by-side" comparison of the static tension performance of a curable adhesive in accordance with the present invention (referred to hereinafter as "New G5") with that of a curable adhesive known in the art and commercially available from ITW under the trade name G5 (referred to hereinafter as "Existing G5"). The data from the test program demonstrates the unpredictably superior performance of the claimed adhesive anchors compared to known anchors. All tests were performed in 2,000 and 4,000-psi normal weight concrete test members and in compliance with ICBO-ES AC58 and ASTM E488-96.

5. The following materials were used:

The Existing G5 epoxy adhesive anchor material consists of an epoxy resin and an amine-based hardener. Both the Existing G5 and the New G5 were packaged in a two-chambered cartridge and were injection dispensed through a static mixing nozzle in a 1:1 volume ratio of resin to hardener.

Threaded rod and reinforcement steel (rebar) dowels were used in the test program. The threaded anchor rod used for bond strength testing of both products was ASTM A-193 Grade 67. The threaded rod was purchased from Bartsch Tool & Screw Company in Addison, IL. The rebar dowels were ASTM A615, grade 60 material.

The test members were unreinforced 2,000-psi and 4,000-psi normal weight concrete slabs. The slab dimensions were 3-ft. wide by 6-ft. long by 1-ft. thick and 3-ft. wide by 6-ft. long by 1.5-ft. thick. The concrete was proportioned in accordance with PCA Design and Control of Concrete Mixtures, Thirteen Edition, ACI 211.11, Standard Practice for Selecting Proportions in Normal, Heavyweight and Mass Concrete and Chapter 19 of the Uniform Building Code (ACI 318-89).

The compressive strength of the test members was determined by preparing and field curing concrete test cylinders in accordance with ASTM C31-90. The concrete test cylinders were tested in accordance with ASTM C39-90 and ASTM C1231-93.

Both the Existing and New G5 anchors were installed using identical procedures that were in accordance with the installation instructions of ITW Ramset/Red Head. Anchor holes were drilled with a rotohammer to the specified embedment depth. All bits used in the test program were carbide tipped. Drill bit diameter at the carbide was measured after the start and completion of a test series. The depth of each anchor hole was measured along the wall of the hole with the extension side of a vernier caliper. Anchor holes were cleaned with a brush and compressed air. After completion of hole drilling and cleaning, the hole was injected approximately half full with the adhesive using an ITW dispensing tool. The threaded rod or rebar was inserted by hand with a slow twisting motion to the bottom of the hole.

6. The following test procedure was followed:

The test equipment consisted of a reaction beam and columns and test apparatus. The beam and columns distributed the test forces. The test apparatus imparted and measured the tension force.

The test apparatus consisted of an Enerpac hollow core hydraulic cylinder, an Enerpac electric pump, Sensotec LVDT displacement sensors, and a Sensotec hollow core compression load cell. A Sensotech data acquisition system and an IBM compatible personal computer were used to collect the test data.

All tests were set-up in compliance with ASTM E488.

The test apparatus was set-up by positioning the reaction beam and columns over the test anchor. The hydraulic ram and hollow core compression load cell were placed on top of the reaction beam assembly.

Two displacement sensors were positioned at 180 degrees onto a wing plate that was fastened to the anchor rod or dowel.

Each anchor was pre-loaded to approximately 5 percent of the estimated peak capacity. An axial force was applied to the anchor at a uniform rate (with a minimum test duration of 1 minute) until the ultimate capacity of the anchor was achieved. Force and displacement were electronically recorded over the full duration of the test.

7. The following results were observed:

Anchor pullout combined with concrete spall was observed in most of the Existing and New G5 tests. Concrete test member fracture and anchor rod failure was observed in some tests. Representative examples of such failures is shown in Figures 1 and 2.

Table 1 (below) presents a summary of the test results.

TABLE 1

Bit Size (in.)	Embed. Depth (in.)	Test Runs	Avg. Peak Load (lb)		Std. Deviation	
			Existing G5	*New G5*	*Existing G5*	*New G5*
3/8	3-3/8	3	7434	8109	1108	247
3/8	4-1/2	3	8258	11,174	1358	227
1/2	4-1/2	5	11,156	12,052	721	171
1/2	6	3	19,919	19073	531	784
5/8	5-5/8	5	18,185	17622	1220	1054
1	9	3	51,017	61,075	3874	462

As can be seen from this data, the adhesive compositions of this invention had a significantly better average peak load compared to the adhesive compositions of the prior art. Also, the peak load performance was much more consistent for adhesive compositions of this invention. This is a particularly important and beneficial feature for concrete anchors that are used in construction industry.

As one skilled in the art, I can attest to the fact that these superior results are not predictable. More particularly, one would not expect that a curing agent having a

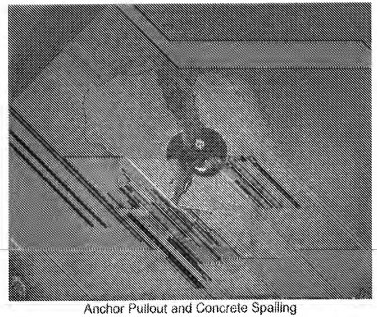
combination of two or more aliphatic amines and at least one tertiary amine would perform better or more consistently than a curing agent known in the art.

8. I hereby declare that all statements made herein of my knowledge are true and that all statements made on information and belief are believed to be true and further that the statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under §1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

_____ _____

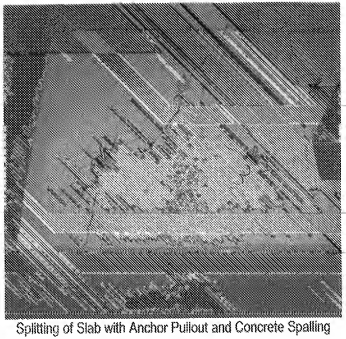
Dr. Wayne Liu Date

FIGURE 1



Anchor Pullout and Concrete Spalling

FIGURE 2



Splitting of Slab with Anchor Pullout and Concrete Spalling